

Chapter 8

Structuring System Logic Requirements

Logic Modeling

- Data flow diagrams do not show the logic inside the processes
- Logic modeling involves representing internal structure and functionality of processes depicted on a DFD
- Logic modeling can also be used to show when processes on a DFD occur

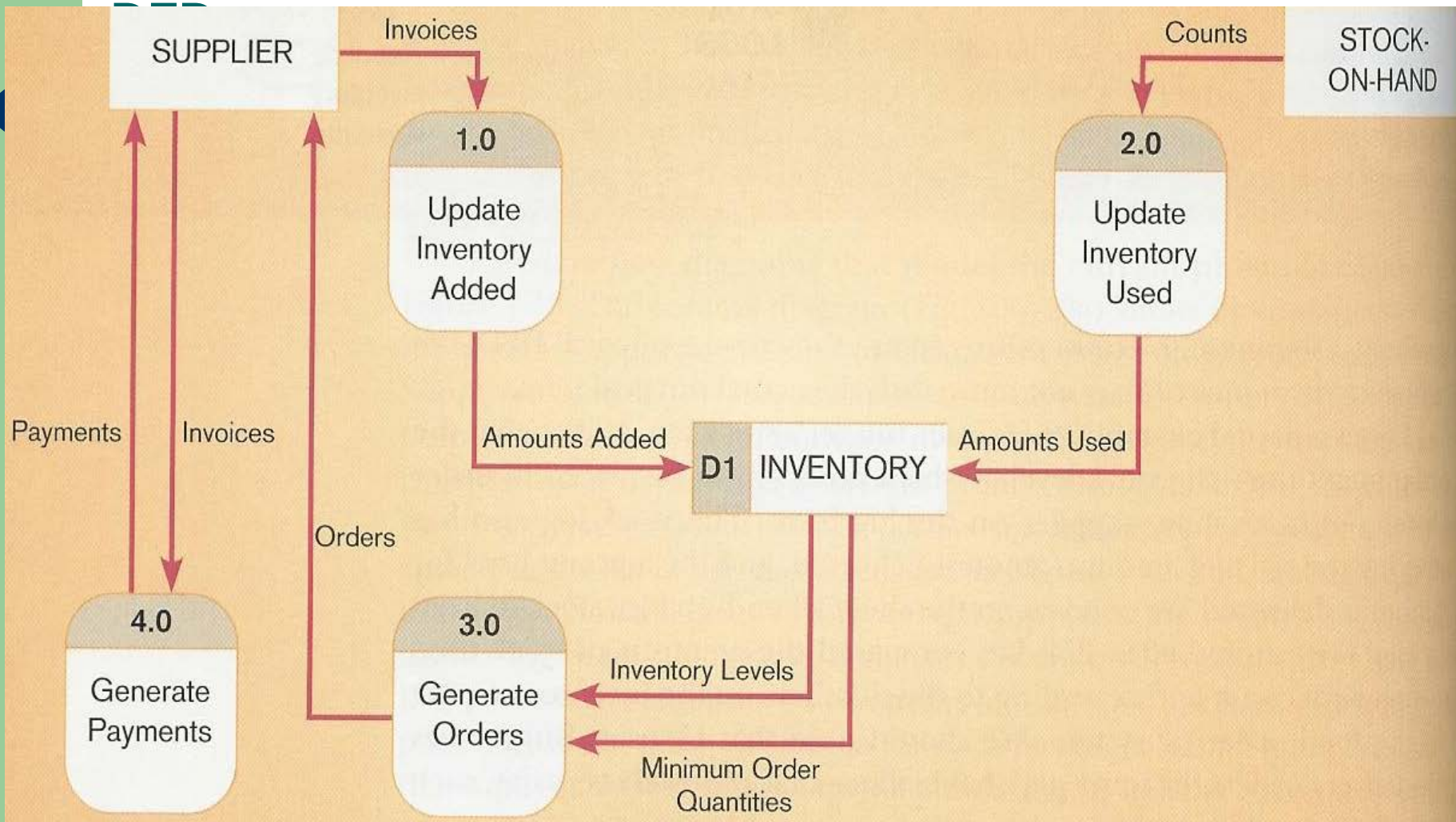
Logic Modeling

- Deliverables and Outcomes
 - Structured English
 - Decision Tables
 - Decision Trees
 - State-transition diagrams
 - Sequence diagrams
 - Activity diagrams

1- Modeling Logic with Structured English

- **Modified form of English used to specify the logic of information processes**
- **Uses a subset of English**
 - **Action verbs**
 - **Noun phrases**
 - **No adjectives or adverbs**
- **No specific standards**
- **Similar to programming language**
 - **If conditions**
 - **Case statement**

Example: Inventory Control System Current Logical



Process 1.0: Update Inventory Added

DO

READ next Invoice-item-record

FIND matching Inventory-record

ADD Quantity-added from Invoice-item-record to Quantity-in-stock on
 Inventory-record

UNTIL End-of-file

Process 2.0: Update Inventory Used

DO

READ next Stock-item-record

FIND matching Inventory-record

SUBTRACT Quantity-used on Stock-item-record from Quantity-in-stock on
 Inventory-record

UNTIL End-of-file

Process 3.0: Generate Orders

DO

READ next Inventory-record

BEGIN IF

IF Quantity-in-stock is less than Minimum-order-quantity

THEN GENERATE Order

END IF

UNTIL End-of-file

Process 4.0: Generate Payments

READ Today's-date

DO

SORT Invoice-records by Date

READ next Invoice-record

BEGIN IF

IF Date is 30 days or greater than Today's-date

THEN GENERATE Payments

END IF

UNTIL End-of-file

2- Modeling Logic with Decision Tables

- It is used when the process contains several different conditions.
- It is better than Structured English when the process is complicated containing several nested statements.
- A decision table is a matrix representation of the logic of a decision
- It specifies the possible conditions and the resulting actions
- Best used for complicated decision logic

2- Modeling Logic with Decision Tables

- Condition stubs
 - Lists condition relevant to decision
- Action stubs
 - Actions that result from a given set of conditions
- Rules
 - Specify which actions are to be followed for a given set of conditions

	Conditions/ Courses of Action	Rules					
		1	2	3	4	5	6
Condition Stubs	Employee type	S	H	S	H	S	H
	Hours worked	<40	<40	40	40	>40	>40
Action Stubs	Pay base salary	X		X		X	
	Calculate hourly wage		X		X		X
	Calculate overtime						X
	Produce Absence Report		X				

Complete decision table for payroll system example

	Conditions/ Courses of Action	Rules					
		1	2	3	4	5	6
Condition Stubs	Employee type	S	H	S	H	S	H
	Hours worked	<40	<40	40	40	>40	>40
Action Stubs	Pay base salary	X		X		X	
	Calculate hourly wage		X		X		X
	Calculate overtime						X
	Produce Absence Report		X				

Employee Type:

S: Salaried

H: Hourly paid

2- Modeling Logic with Decision Tables

- Indifferent Condition

- Condition whose value does not affect which action is taken for two or more rules

Conditions/ Courses of Action	Rules			
	1	2	3	4
Employee type	S	H	H	H
Hours worked	—	<40	40	>40
Pay base salary	X			
Calculate hourly wage		X	X	X
Calculate overtime				X
Produce Absence Report		X		

Standard procedure for creating decision tables

- ◆ Name the conditions and values each condition can assume (values may be limited entry (yes or no) or extended entry (more values)).
- ◆ Name all possible actions that can occur
- ◆ List all rules (sometimes it may be redundant, but you have to list them all then reduce them at the end)
- ◆ Define the actions for each rule
- ◆ Simplify the table

Example of decision table for Hoosier Burger's Inventory reordering

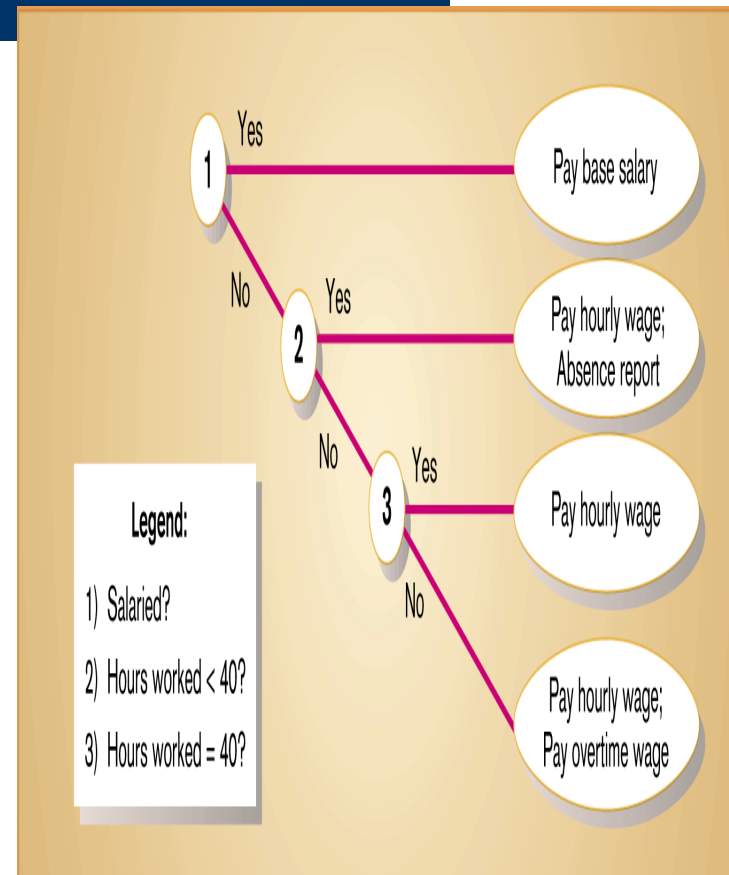
Conditions/ Courses of Action	Rules											
	1	2	3	4	5	6	7	8	9	10	11	12
Type of item	P	N	P	N	P	N	P	N	P	N	P	N
Time of week	D	D	W	W	D	D	W	W	D	D	W	W
Season of year	A	A	A	A	S	S	S	S	H	H	H	H
Standing daily order	X				X				X			
Standing weekend order			X				X				X	
Minimum order quantity		X		X		X		X		X		X
Holiday reduction									X		X	
Summer reduction					X		X					
Type of item: P = perishable N = nonperishable Time of week: D = weekday W = weekend Season of year: A = academic year S = summer H = holiday												

Reduced decision table for Hoosier Burger's Inventory reordering

Conditions/ Courses of action	Rules						
	1	2	3	4	5	6	7
Type of item	P	P	P	P	P	P	N
Time of week	D	W	D	W	D	W	-
Season of year	A	A	S	S	H	H	-
Standing daily order	X		X		X		
Standing weekend order		X		X		X	
Minimum order quantity							X
Holiday reduction					X	X	
Summer reduction			X	X			

3- Modeling Logic with Decision Trees

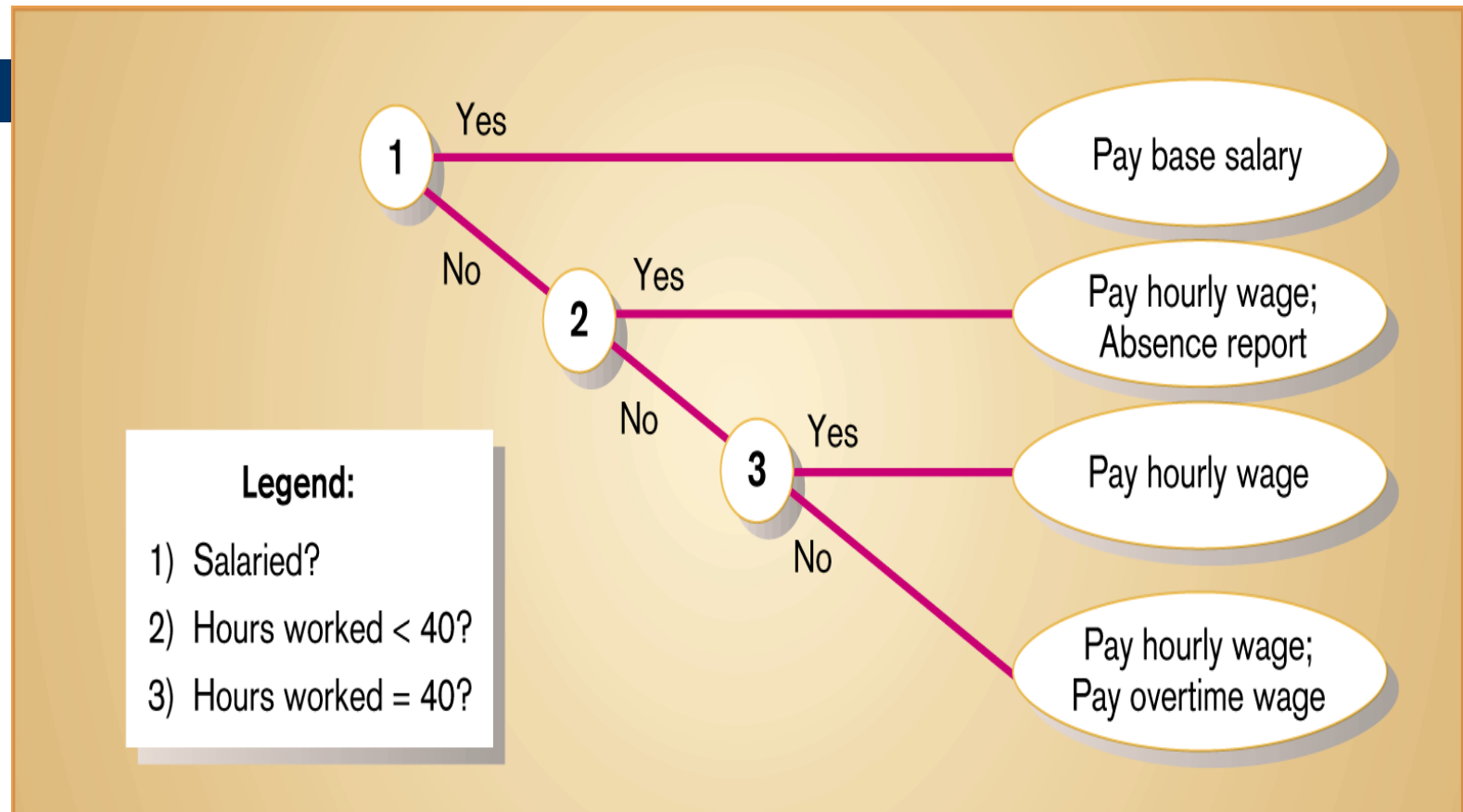
- A graphical representation of a decision situation
- Both decision trees and tables are used for communication with users.
- Decision situation points are connected together by arcs and terminate in ovals
- Two main components
 - Decision points represented by nodes
 - Actions represented by ovals



3- Modeling Logic with Decision Trees

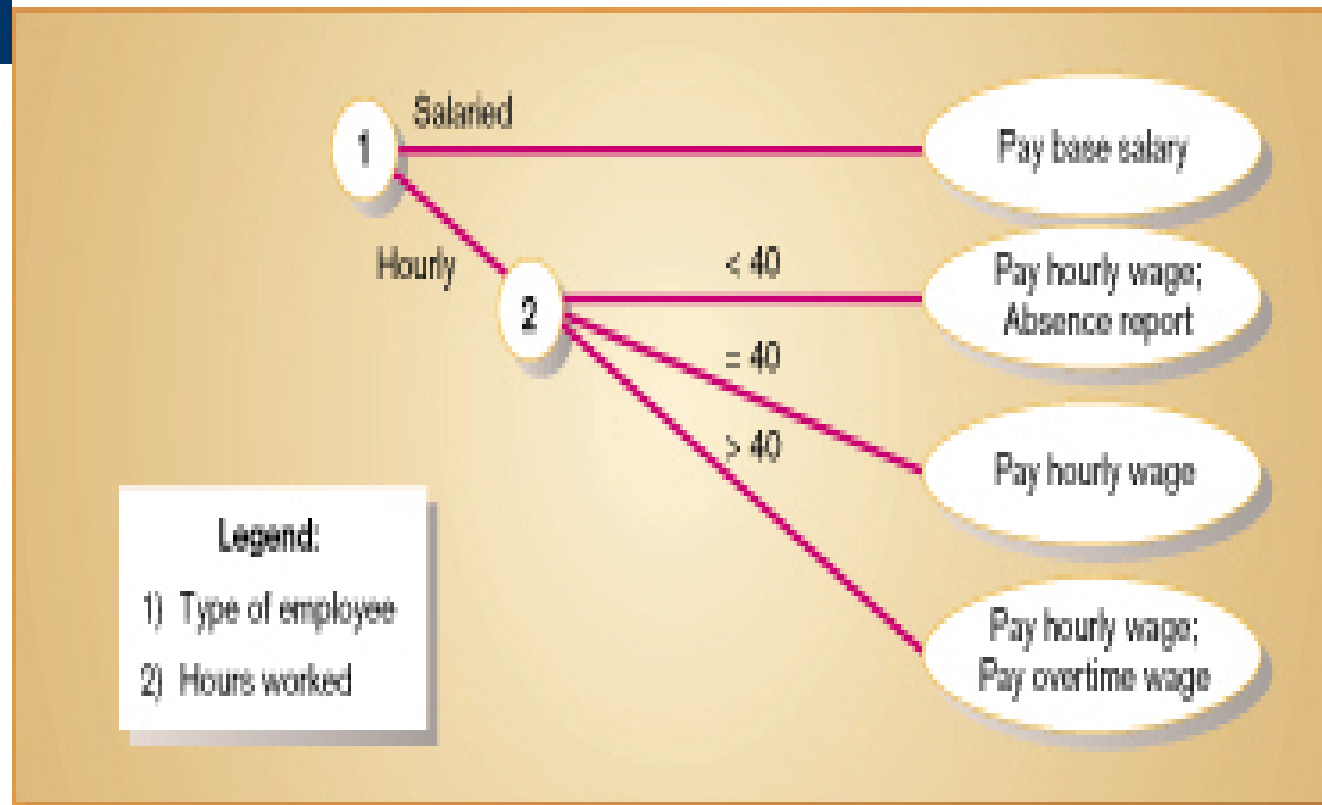
- **The first node on the left is called root node**
- **The tree is read from left to right**
- **Each node is numbered and corresponds to a choice**
- **The description of the choice is shown on a legend**
- **All possible actions are listed on the far right**
- **Each rule is represented by tracing a series of paths from root node, passing several nodes until an action is reached**

Decision tree of payroll system example



Modified Decision tree

of payroll system example



Deciding Among Structured English, Decision Tables and Decision Trees

Criteria	Structured English	Decision Tables	Decision Trees
Determining Conditions and Actions	Second Best	Third Best	Best
Transforming Conditions and Actions into Sequence	Best	Third Best	Best
Checking Consistency and Completeness	Third Best	Best	Best